

CHAPTER 2

General Considerations

2-1 Automotive Craft Activities

a. Automatize repair is an authorized activity within the Army Arts & Crafts program. Due to the nature of this activity, a separate specialized facility is authorized for each installation.

b. Basic automotive service operations are performed in Auto Crafts Centers. In addition, facilities are provided for instructional programs, club meetings, administrative tasks, tool issuance, and storage, and limited sales of parts.

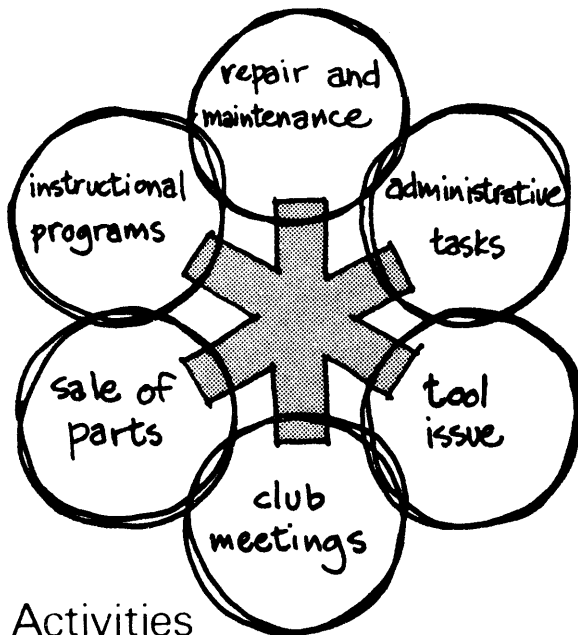
c. Repair and maintenance activities can be categorized by work performed on the following components:

- (1) Engines
- (2) Fuel Systems
- (3) Electrical Systems
- (4) Suspension Systems
- (5) Braking Systems
- (6) Clutch/Drive Line Systems
- (7) Transmission
- (8) Differentials
- (9) Heating, Ventilating and Air Conditioning Systems
- (10) Bodies and Fenders

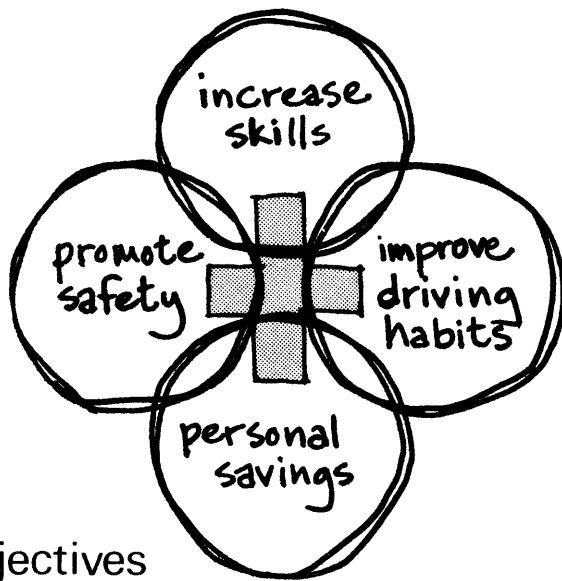
d. Specifically, activities are oriented toward the constructive repair and maintenance of personal vehicles such as cars, trucks, trailers, motorcycles and bicycles. Vehicle owners must perform their own repairs with only guidance from supervisors. Because of high demands on facilities, priority is given to those activities which can be completed in a relatively short time. Shop supervisors are required to limit the scope of a project to the ability of the individual. Therefore, many highly specialized operations are not generally performed, and long term repairs are authorized on a space available basis. Some storage space must be provided for inoperative vehicles, but many installations require disposition of abandoned vehicles, supplies, and personal property left over 30 days.

e. Generally the larger Auto Crafts Centers have tools and equipment available to accomplish the following:

- (1) Motor tune-up, engine overhaul and cleaning
- (2) Wheel balancing and tire repairs
- (3) Steering and front-end alignment
- (4) Brake repair and adjustments
- (5) Differential adjustment and repair
- (6) Fuel, cooling, exhaust, ignition and electrical system work
- (7) Clutch and transmission repair
- (8) Oil changing and lubrication
- (9) Headlight adjustments
- (10) Body repair and spray painting
- (11) Cutting and welding parts
- (12) Air conditioner repair



Objectives



- (13) Cleaning and repairing car interiors
- (14) Installation of accessories
- (15) Battery charging
- (16) Car washing

f. Automotive craft activities also go beyond the repair of an individual's vehicle. The Army encourages a diversified program with instruction in maintenance, repair, safety and good driving habits. Supervisors organize car clinics, road rallies, gymkhanas, obstacle course competitions, safety inspections and demonstrations.

g. Classes of instruction in auto mechanics, anti-pollution control, upholstery, air conditioning, welding and body work may also be conducted in conjunction with the Army General Education Development (G.E.D.) Program. These classes may utilize the auto repair facilities for practical laboratory experience necessary to develop skills and to meet certain Military Occupational Speciality (MOS) requirements.

2-2 Auto Crafts Centers

a. One Auto Crafts Center is the authorized minimum requirement for each installation. The establishment of additional auxiliary auto crafts centers must be justified by degree of interest, size of installation, and the dispersal of the installation population. Authorization to establish and operate an auxiliary facility will be predicated on availability of funds, supervisory personnel, and the maximum authorized space allowance as established by the Department of Defense *Construction Criteria Manual*, 4270.1M.

b. Facilities can be functionally divided into the following areas: general repair and tune-up stalls; muffler and tire shop; lubrication stalls; body shop; spray paint booth; steam cleaning stall; machine shop and welding area; classroom space; tools and parts storage; off ice space; utility and service areas.

c. Since participants will include dependents and retirees, Auto Crafts Centers must be accessible to and usable by the physically handicapped. Refer to ER 1110-1-102, *Design for the Physically Handicapped*, for guidance.

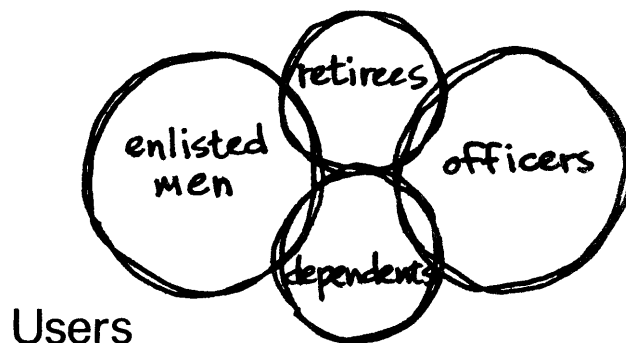
2-3 Participants

a. The Auto Crafts Center is frequently one of the most popular of all arts and crafts facilities. The primary users are assigned military personnel, both officers and enlisted men. Others who are generally eligible to be shop patrons on a space available basis are military retirees and dependents of assigned personnel, whose vehicles are registered with installation authorities.

b. The maximum number of participants to use the center at any one time is limited by the amount of work space available and the amount of space for instruction and demonstrations. Since operating procedures generally require that vehicle owners must perform their own repairs with possible help from friends who are eligible patrons, the number of actual users at any one time is relatively small. For a thirty-four stall facility, a reasonable estimate of the maximum number of users performing repairs at one time might be sixty to seventy-five. Classroom participation could add an additional thirty patrons.

c. Many factors influence the number of participants in automotive craft activities, but one of the most important is the interest that can be generated in a diversified program. Efficient scheduling for a rapid turnover of projects is also necessary for maximum participation. Usually, participation will be proportional to the size of the facilities readily available to the military community. It is especially important that auto craft facilities be open on weekends, holidays, evenings, and times when military personnel are off duty. These are the times of maximum participation.

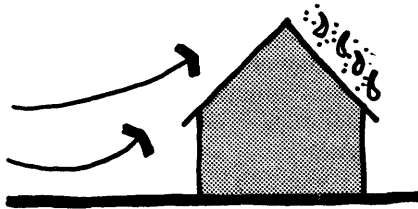
d. Administrative personnel may include a shop supervisor, one automatize repair instructor for every four stalls in operation, a tool issue/sales attendant, and a few part-time or visiting classroom instructors.



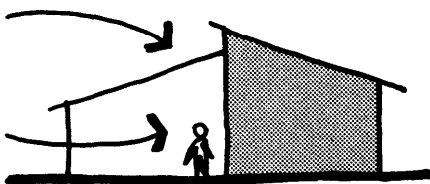
2-4 Climatic Influences

a. Climatic variations play an important part in the building design of Auto Crafts Centers and the selection of materials and systems used therein. Current definitive drawings are based only upon the design approach of each auto stall having direct access to the exterior through large overhead garage doors. This practice, especially in colder climates, should be reevaluated in future projects in view of current energy conservation policies. Frequent use of garage doors lets in cold air which increases energy usage and creates uncomfortable working conditions. On the other hand, it is often desirable to operate with the doors open in warm weather. This one example illustrates the influence climate can have in the design of this building type and reinforces the requirement that careful analysis involving various cost and function trade-offs be made in each instance:

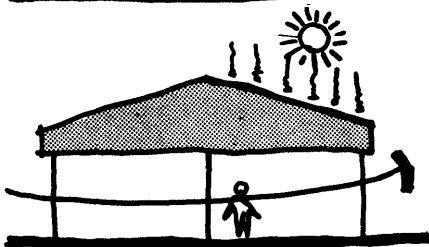
b. In mild climates, many auto craft activities can be performed outdoors or under covered canopies. Within authorized space allowances, covered work areas are calculated at one-half of the square footage of equal sized enclosed spaces and advantage can be made of this to increase the total amount of allowable work space. Outdoor spaces should also be designed with local conditions in mind. For example, wind driven sand can negate the usefulness of a covered outdoor work area which is improperly oriented or shielded from the prevailing winds.



(1) Severe climate dictates compact building forms.



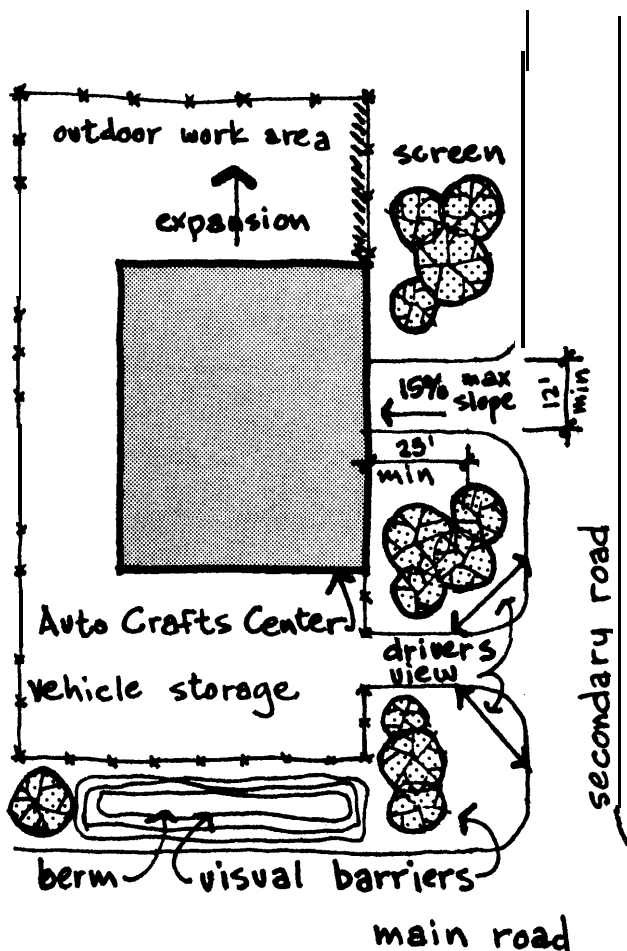
(2) Temperate climate permits the use of natural ventilation and light.



(3) Warm climate permits maximum use of covered exterior work areas in addition to indoor space.

Building Orientation Factors

2-5 Siting



a. Installation master plans are guides for future land development and indicate specific locations of proposed facilities. They evolve from an analysis of requirements for housing, service activities, and military operations. Ecological considerations, utility and transportation modes, as well as natural characteristics of the terrain are some of the factors which contribute to the formulation of the plan.

b. Unlike other activities of the arts and crafts program, Auto Crafts Centers need not be located close to other social/recreational facilities. Past attempts to combine auto craft facilities with Arts and Crafts Centers have proved unsuccessful, and the practice is now discouraged.

c. The nature of many operations performed in Auto Crafts Centers is largely light industrial, and it is therefore appropriate that these facilities be sited near compatible activities. Auto Crafts Centers with their stored vehicles, security fences, and sometimes noisy operations often tend to become nuisances in residential or community support areas, although this does not have to be the case. Care should be taken in site selection, site development, architectural treatment, and the use of man-made and natural barriers to prevent this from happening.

d. Where ever possible, the vehicular entrances to the site should not be directly from a major thoroughfare. For safety, the distance between any shop entrance and the street should be at least 25 feet. One-way driveways are preferred with a minimum width of 12 feet and a straight entrance into the garage. Sharp turns near entranceways cause accidents. Parking aprons and driveways should slope gradually away from the building for good drainage, but a slope of 15% should be the maximum for entrances. However, by scoring the concrete with grooves, in a "V" shaped pattern, the entrance will have good drainage and less slippage.

e. Patron parking should be provided for a minimum of one-half the vehicular capacity of the shop. This is particularly important for garages geared to a quick turnover of services. The parking area should be convenient to the shop entrance, yet not interfere with car circulation.

f. In addition to patron parking, a paved outdoor work and vehicle storage area should be provided. This area may be used to park inoperative vehicles and store bodies and chassis awaiting parts as well as to provide outdoor work space. Outdoor work and storage areas can be an unattractive nuisance and should be fenced and screened for security and aesthetic reasons.

Site Considerations

2-6 Site Development

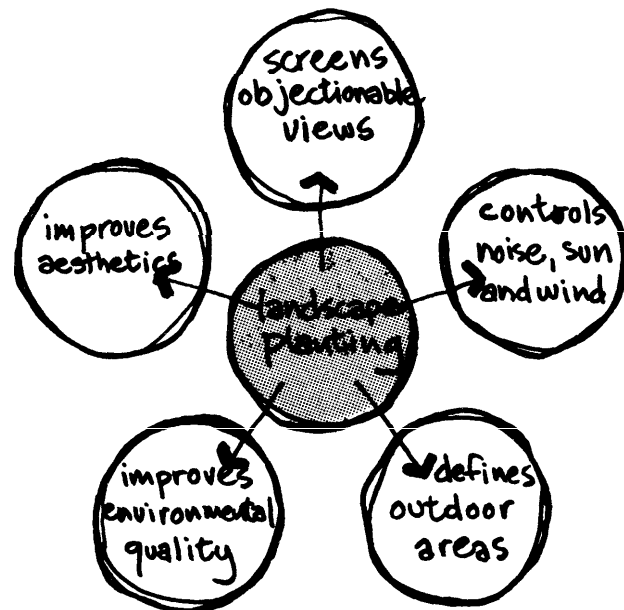
a. Garages have an unfortunate and often undeserved reputation as being potential eyesores. If for no other reason, landscaping can play an important part in refuting this premise. But apart from beautification, foliage and other site improvements can serve a much more functional purpose. Landscape planting can define outdoor work areas, direct the flow of traffic, muffle noise, screen objectionable views, control sun and wind, and conserve energy. Planting adds to the environmental qualities of an area by controlling erosion, absorbing carbon monoxide and dioxide, and discharging oxygen.

b. Landscape designs should be as maintenance-free and vandal proof as possible. However, landscape planting should not be so minimal or so protected that it defeats its functional and aesthetic purposes.

c. Paving materials, benches, and other landscaping structures should be selected for durability together with their other qualities of texture, scale, shape and color.

d. Desirable plants are those that are most resilient or defensive in nature, with tough leaves or bark, or fine thorns. In addition to evergreens, selections should be made from those that blossom in spring, bear foliage or fruit in the summer, and change color in the fall to produce a continuing interest.

e. Improper location of planting can also produce hazards by obstructing the views of drivers and pedestrians. Particular care to avoid this condition should be taken because of the inherent danger of frequent movement of vehicles.

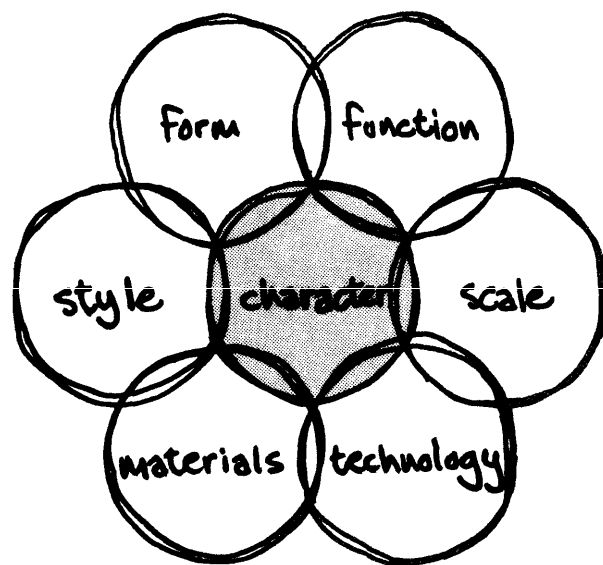


Landscape Functions

2-7 Architectural Character

a. Auto Crafts Centers should be accepted for what they are; structures that house the repair and maintenance of 20th century machines. It seems appropriate that their design should reflect the industrialization and technology of the society that mass produces the vehicles themselves. In addition, these facilities should also reflect the fact they are craft shops. They are places where an individual renews and tunes to peak efficiency his own vehicle within the limits of his ability. Auto Crafts Centers should not be cold, impersonal or overbearing. Careful consideration of color, scale, and texture can do much to enhance the character of these buildings.

b. The adoption of an industrial design approach does not mean that the solution need have an ugly industrial quality. Aesthetically undesirable design products usually result from insensitivity and lack of understanding of good design which is often justified in the name of economy and expediency. Harmonious materials, careful detailing, screening of unsightly areas, and imaginative use of color can all contribute to aesthetic quality. The building should exemplify- desirable characteristics of local construction practices, with materials chosen on the basis of availability, economy, durability and capability to generate visual interest through color and texture.



Character Determinate

2-8 Interior Design

a. Interior design features must be developed in coordination with the architectural design. All features of the building relative to the interior design, whether they are furnished and installed as part of the construction contract or provided later by the using service, must be developed as an overall scheme. Graphic design and signage should be included as part of the overall design to identify activities and facilitate functional effectiveness.

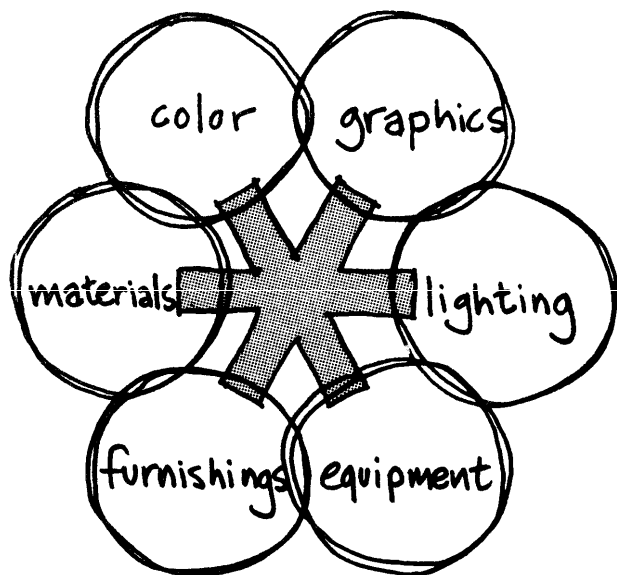
b. Use of color in Army facilities is limited to a practical number selected from Federal Standard 595A, Colors. General guidance for color selection is provided in TM 5-607-7, *Colors for Buildings*. Color should be used to stimulate human physical and emotional reactions and to enhance the overall functionality of the Auto Crafts Center. In critical seeing areas, glare, brilliant colors and great brightness differences, both in the lighting system and in the color of walls, floors, furnishings and equipment should be avoided.

c. The effectiveness of an automotive craft program depends on the availability of suitable equipment, tools and supplies. The equipment and furnishings in the buildings can be categorized as follows: those used in the testing and repair of vehicles; those used as instructional aids; and the general furniture and accessories used in the support areas such as the classrooms and office.

d. The *Catalog of Army Arts and Crafts Program Equipment* contains illustrations and specifications for equipment for the Army Arts and Crafts Program. Essential Facilities and Equipment for Program Operations. Arts and Crafts Program, lists essential equipment and budget prices. However, none of these sources cover all program items and costs, and specifications should be obtained from three major sources:

- (1) Army schedules for government furnished standard items as indicated by the various commands.
- (2) Schedules from GSA and Federal Prison Industries.
- (3) Commercial supply firms.

e. The proper spacing of equipment and adequate power supply is essential for the safe operation of the shops. The maximum number of tools is governed by the amount of area required for safe operation. Islands of space around most power tools is essential for safety. These requirements are identified in Chapter 3.



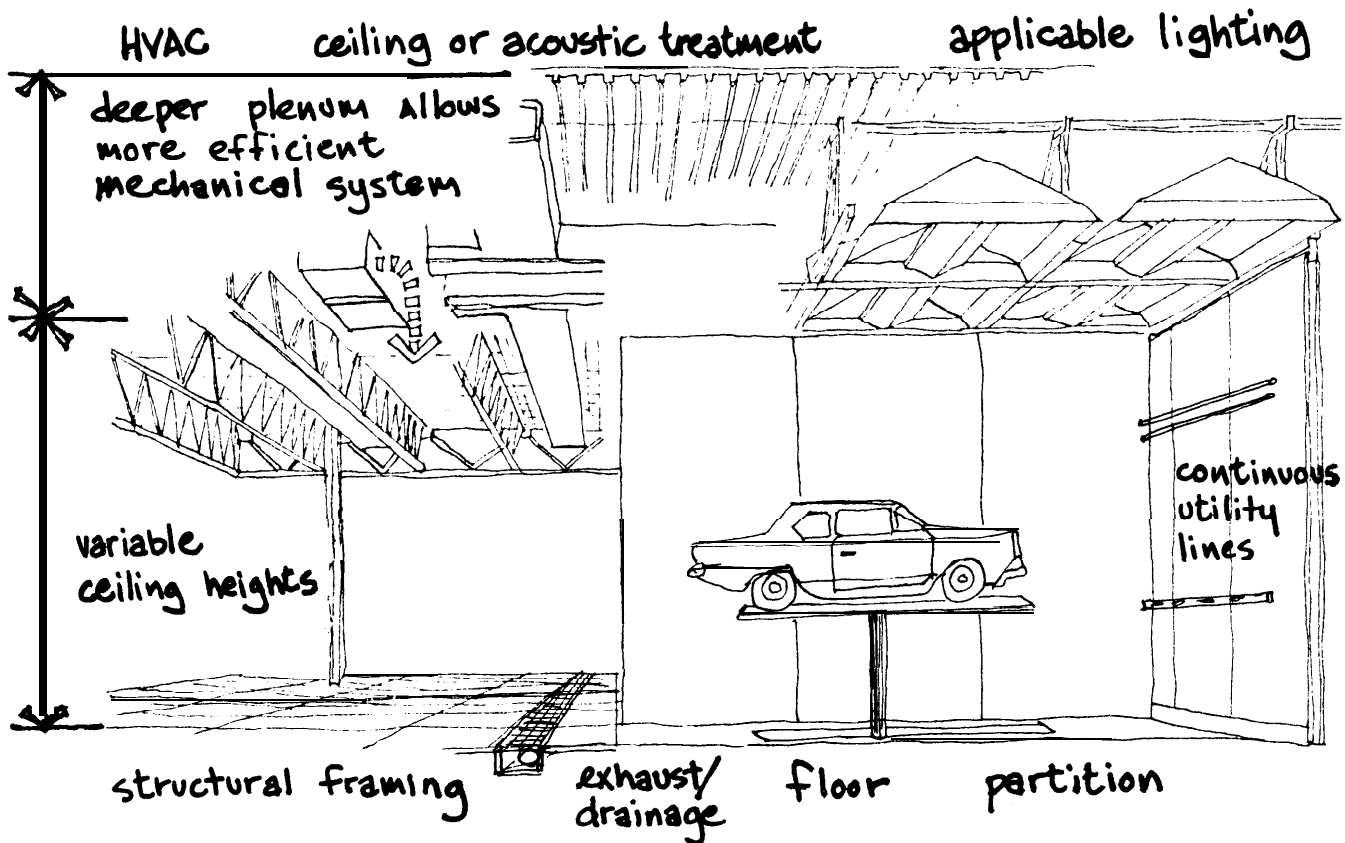
Interior Design Elements

2-9 Systems Building

a. Systems building is the application of modern production techniques to the building process. While not universally applicable, systems building is expanding in the construction industry.

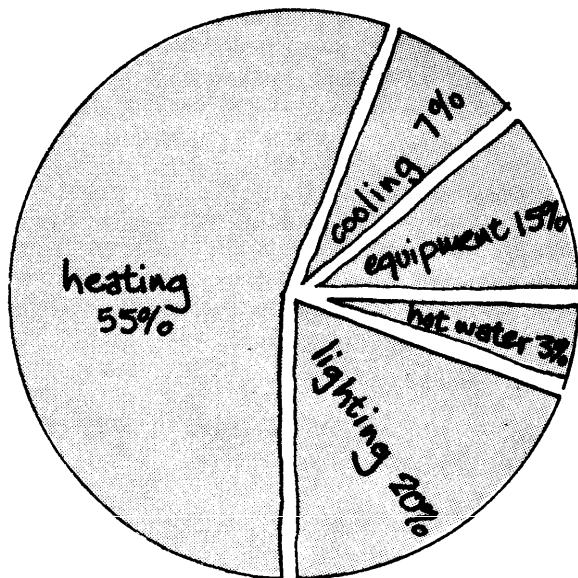
b. Systems built facilities are composed of sub-systems which typically include structural framing systems, lighting and ceiling systems, heating, ventilating and air-conditioning systems, and interior partitioning systems. The best examples of systems built facilities offer economy of both time and money committed to construction, a high degree of quality control, and maximum flexibility of space.

c. In many cases systems building is applicable to military construction, and its feasibility should be considered, particularly for Auto Crafts Centers. Building systems selected should be those which are most economical and suitable based on comparative cost studies for the building.

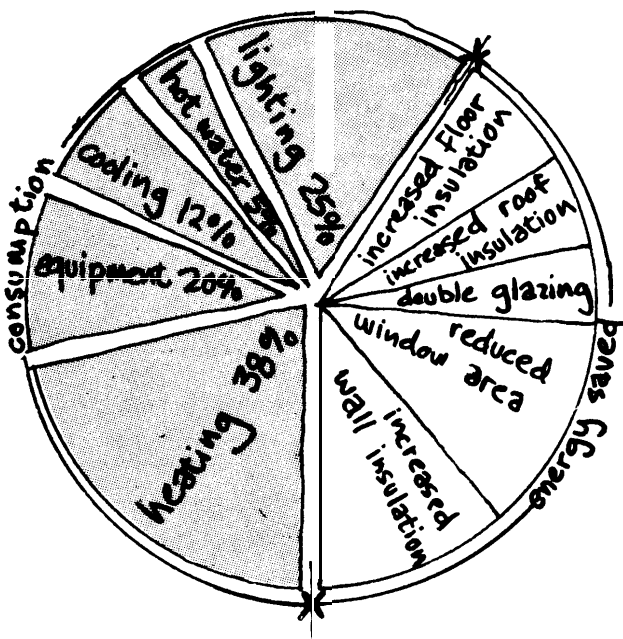


Sub-Systems

2-10 Energy Conservation



Typical Annual Energy Consumption



Possible Savings In Annual Energy Consumption

a. With decreasing energy sources, conservation must be practiced in all facilities at military installations. New construction offers a variety of methods to conserve energy. The skillful exploitation of local climate conditions, topography, trees, solar exposure, and other natural features, combined with building orientation, compact building shapes, and wall shading, offer opportunities for energy conservation. The simple consideration that each side of a building may require different treatment depending on its exposure is often overlooked in designing an energy efficient building.

b. Auto Crafts Centers, with their numerous exterior overhead doors, are often wasteful of energy for heating and cooling. However, in warm climates large openings help provide a comfortable interior environment without the need for mechanical ventilation or cooling. Thus energy conservation can be important when considering the basic design solutions at a particular installation. Another obvious area to consider in energy conservation is the selection of mechanical and electrical systems and their control. Night time control settings and automatic regulation of power equipment can produce significant savings. The amount of building insulation, particularly in the roof, is another important factor, and heat recovery devices must be considered.

c. Long-range (life cycle) costing which compares initial capital improvement costs with extended operational costs is a valid method to determine the most efficient balance between building and mechanical systems.

d. Lighting intensities should conform to the minimum levels recommended by the latest edition of *Illumination Engineering Society Lighting Handbook*. Where practical, lighting will be designed for specific local tasks instead of providing uniform general loads.

e. The upper chart on this page shows the proportion of typical annual energy consumption for an auto crafts center. The second chart shows a possible 40% savings savings in total consumption due to various conservation techniques, resulting in a reapportionment of energy consumption. Conservation techniques when used at the time of construction provide a real savings during the life of the facility in both resources and operating funds.

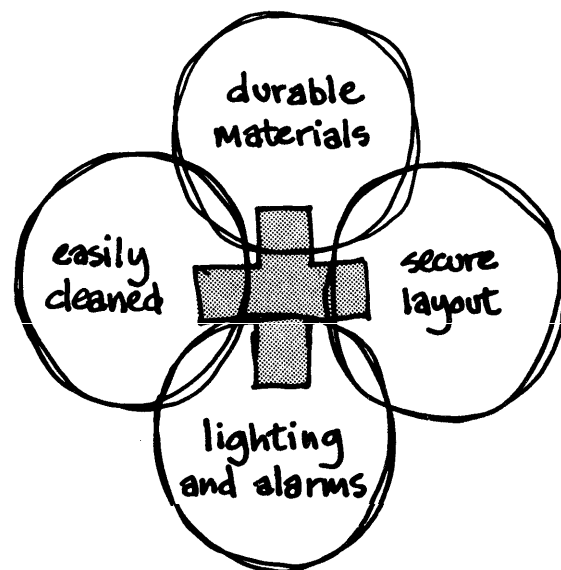
2-11 Minimizing Maintenance and Vandalism

a. Auto Crafts Centers are subject to a high incidence of vandalism, pilfering, accidents, and heavy wear and tear. This is due partly to the fact that moving vehicles can be destructive, and their very weight and mobility are potential dangers. The process of car repair also involves the use of gasoline, grease, toxic fumes, acids, and other substances which soil and create hazards.

b. It is particularly important to exercise care in the selection of materials, finishes, and pieces of equipment that will stand up to heavy use and can be easily maintained. The use of residential type overhead garage doors is a case in point, Except in the most dire economic circumstances they should not be used, because they are not designed to withstand such service and their hoisting mechanisms frequently break down.

c. Security considerations are equally important. Shops contain tools, parts, and automobiles that are attractive temptations to a significant number of people. Points of entrance should be lighted and designed to be easily seen from the outside by security patrols and easy to control internally by the staff. Outdoor vehicle storage areas should be fenced and provided with appropriate lighting.

d. Vandalism is an increasing social problem nearly everywhere, including military installations, and must be considered when designing an Auto Crafts Center. The layout of the building, the elimination of hard to supervise areas, the use of durable materials and security lighting are important in alleviating this problem.



upkeep Factors

2-12 Found Space In Existing Buildings

There are facilities on many installations that no longer serve their designated purposes. Finding and adapting space in such buildings to other functions may be a solution to the space needs of an Auto Crafts Center. However, a careful analysis of functional suitability and economics is required before such a decision can be reached.

b. In order to determine the validity of using found space the planner should, in the preliminary stage, prepare an inventory of existing buildings that are available for the intended use. Any existing facility considered for long term use as an Auto Crafts Center should, as a first principle, fit within the land-use parameters of the installation master plan. An analysis of the suitability of a particular facility for its proposed adaptive use should follow a progressively more detailed evaluation. A primary test of suitability should include:

- (1) Location and accessibility – An otherwise suitable building which is in the wrong location in not a viable solution unless other factors can be introduced.
- (2) Site Size – The site must be adequate for its proposed function which may also include building additions.
- (3) Comparability of Functions – The Auto Crafts Center must be compatible with adjacent facilities,
- (4) Availability of Utilities – An advantage of found space may be the cost savings resulting from existing utilities. Conversely, lack of basic services may be grounds for rejecting such space.

c. Facilities that appear to meet the foregoing primary test can be surveyed to determine the feasibility of converting or remodeling the buildings. The survey of an existing structure should follow an analytical format to permit value judgments of its suitability.

d. There are a number of evaluation techniques in use today. The best generally accepted methods rely on a numerical scoring system to arrive at an index of economic and functional acceptability. All methods are necessarily subjective to a greater or lesser extent, and the judgment and experience of the surveyor is an important factor.

e. The chart on page 19 illustrates one analytic format which is suitable for the level of complexity of an Auto Crafts Center. It establishes a numerical framework within which the intrinsic value of a potential "found space" building can be approximately determined,

f. The 12 major site elements and 15 major building elements listed in column 1 are assigned a percentage of the

Survey and Evaluation of Existing Buildings

1. SITE AND BUILDING ELEMENTS	2. PERCENTAGE VALUE OF ITEM	3. PERCENTAGE ACCEPTABLE IN THIS BUILDING	4. ACTUAL VALUE FACTOR
LOCATION SURVEY			
1 AVAILABILITY	[30]	[80]	[24.0]
2 PUBLIC TRANSPORTATION	[5]	[50]	[2.5]
3 PRIVATE TRANSPORTATION	[7]	[80]	[5.6]
4 PEDESTRIAN ACCESS	[3]	[70]	[2.1]
5 SAFETY	[5]	[60]	[3.0]
6 COMPATIBILITY	[10]	[75]	[7.5]
SUBTOTAL	[60]		[44.7]
SITE SURVEY			
7 SANITARY SEWER	[10]	[100]	[10.0]
8 ELECTRIC SERVICE	[10]	[50]	[5.0]
9 WATER SERVICE	[10]	[30]	[3.0]
10 SIZE	[5]	[50]	[2.5]
11 ROADS, WALKS, PARKING	[3]	[30]	[0.9]
12 LANDSCAPING	[2]	[10]	[0.2]
SUBTOTAL	[40]		[21.6]
TOTAL	[100]		TOTAL V.F.% [66.3]*
ARCHITECTURAL SURVEY			
1 SIZE	[5]	[80]	[4.0]
2 EXTERIOR WALLS	[6]	[70]	[5.6]
3 ROOF	[3]	[30]	[0.9]
4 FLOOR	[4]	[90]	[3.6]
5 CEILINGS	[3]	[60]	[1.8]
6 PARTITIONS	[7]	[10]	[0.7]
7 WALL FINISHES	[2]	[0]	[0]
8 FIXED EQUIPMENT	[4]	[0]	[0]
9 MISCELLANEOUS	[4]	[0]	[0]
SUBTOTAL	[40]		[16.6]
STRUCTURAL SURVEY			
10 EXCAVATION AND SUBSTRUCTURE (FOOTINGS)	[5]	[100]	[5.0]
11 SUPERSTRUCTURE (FRAME, COLUMNS)	[2]	[100]	[2.0]
12 HORIZONTAL FRAME (JOISTS, BEAMS, SLABS)	[18]	[90]	[16.2]
SUBTOTAL	[25]		[23.2]
ENVIRONMENTAL SYSTEMS SURVEY			
13 HEATING, VENTILATING, AND AIR-CONDITIONING	[20]	[50]	[10.0]
14 PLUMBING	[5]	[75]	[3.8]
15 ELECTRICAL	[10]	[65]	[6.5]
SUBTOTAL	[35]		[20.3]
TOTAL	[100]		TOTAL V.F.% [60.1]*

* See paragraph 2-12.h

cost for a complete building. The percentages listed are typical and taken from construction cost indices. They may vary depending on local or special factors.

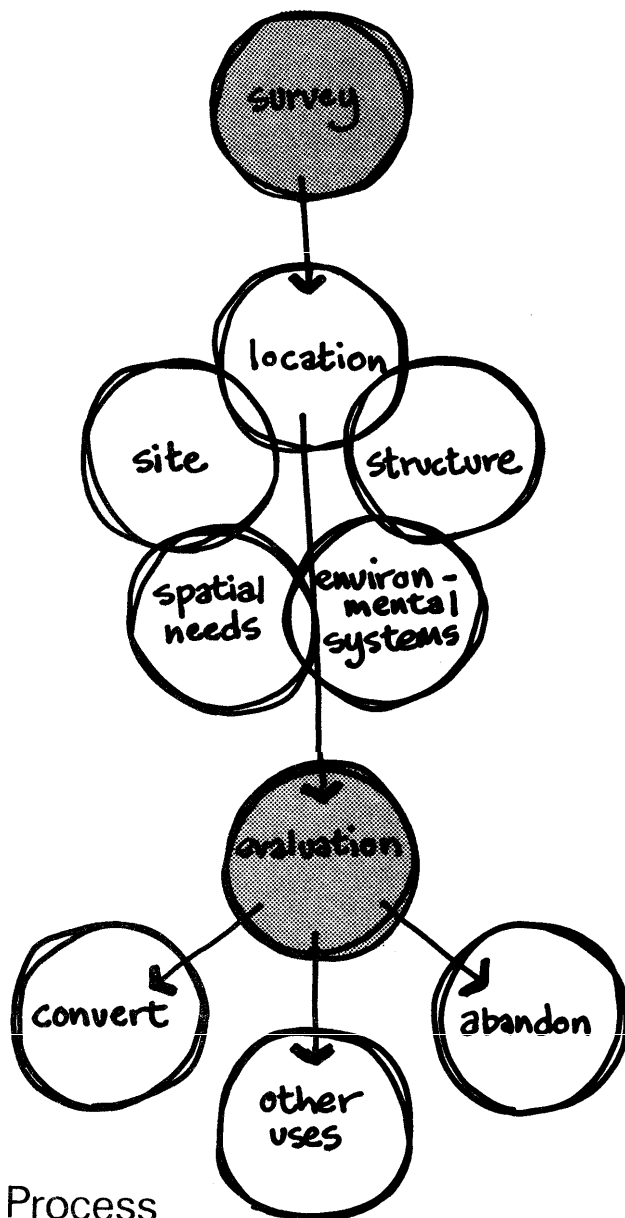
g. In most cases, a visual inspection by a knowledgeable surveyor, can result in a numerical value being assigned to the percentage acceptable for each element. Those elements that are entirely acceptable are assigned a value, or "feasibility factor" of 100. Those that require modifications are given lower numbers as are judged appropriate. These are entered in column 3.

h. Column 4 provides an "Actual Value Factor". It is determined by multiplying columns 2 and 3, and dividing by 100. The total of all actual value factors produces an overall value factor which offers a useful yardstick in approximating the relative worth of an existing facility compared to a new structure. One rule of thumb is that if the overall value factor is over 50% it would be reasonable to pursue in greater detail the economic feasibility of converting its space. Simplified, that means, the existing facility in its present state is worth half that of a new physical facility. A sample evaluation is shown on the chart.

i. If the proposed facility has passed this test of acceptability, the next step is to establish preliminary cost estimates for bringing the building to a state of usefulness for its new function. This usually requires the preparation of conceptual design drawings and an analysis of the usefulness of the converted space. Experience has shown that if a building is converted to another use, it will usually have to be larger than a building designed specifically for this use, because of inherent problems of flexibility and structural limitations.

j. Following the preparation of a program, a conceptual design response to it, and a preliminary cost estimate, some valid judgments can be made on the advisability of converting space. Obviously, if the cost of the conversions are high in ratio to the Overall Value Factor the economics of conversion are highly suspect.

k. The initial cost of construction or of conversion should not be the only economic criteria for decision making. Life-cycle costing is a method of determining the economic feasibility of facilities taking into account the useful life expectancy of a converted facility against a new one. It recognizes that initial cost is only one, and by no means the largest, expense in a building's life. Operating and maintenance costs are also considered. By amortizing all costs over the life expectancy of a facility, a comparative economic evaluation prorated on an annual basis can be established. This then can form the foundation for economic decisions.



i. In chapter 5 of this Design Guide, an example of converting a common warehouse structure into an Auto Crafts Center is illustrated.

m. Another way of evaluating criteria for found space is through a checklist. The chart on this page is a simplified tabulation of the facility requirements from Chapter 3 of this guide, and is intended to be used as a criteria checklist. A number or specific requirement is written in the top half of many of the squares. If the space being evaluated meets these criteria enter a checkmark or numerical

rating in the lower half to indicate how well the requirement is met. Where the darker shading exists in the upper half of the square, there is a requirement without a specific quantity. Again a checkmark or numerical rating should be placed in the lower half. If the space being evaluated does not meet the requirements then a "X" or a zero should be placed in the lower half of the square. Where the lighter shading exists there is no requirement. This checklist is a simple means of evaluation and can be easily used to analyze found space with respect to functional requirements.

Criteria Checklist for Evaluation																	
ACTIVITY	REQUIREMENT																
	Programmed Area	Number of Stalls	Minimum Ceiling Height	Structural Appropriateness	Required Egress	Building Code Requirements	Access to Exterior Areas	Acoustical Treatment	Lighting Level	Power Required	Ventilation	Exhaust System	Vacuum	Water	Floor Drains	Gas	Compressed Air
General Repairs and Tune-ups	312	17	12'		2				70 Fc	115/228							
Muffler and Tire Shop	1728	6	15'		2				70 Fc	115/228							
Lubrication Stalls	1728	6	15'		2				70 Fc	115							
Body Shop	864	3	15'		2				70 Fc	115/228							
Paint Booth	288	1	12'		2				70 Fc	115/228							
Steam Cleaning Stall	288	1	12'		1				50 Fc	115/228							
Machine and Welding Shop	2000		12'		2				70 Fc	115/228							
Office and Storage Areas	1500		10'		2				70 Fc	115							
Classroom	650		10'		1				70 Fc	115							